AMENDMENTS TO THE CLAIMS

1. (Previously Presented) A method for automatically detecting breast tumors and lesions in an image comprising:

acquiring an image of a breast;

filtering the image;

applying texture and intensity classifiers to each pixel of the image, the classifiers corresponding to probabilities of the pixel belonging to a lesion or tumor;

determining a seed point in the image by retrieving a set of points of interest in the image, selecting a first point from the set of points, calculating a joint probability that the first point corresponds to a tumor, calculating mean joint probabilities that points in a circular region around the first point correspond to a tumor, and designating a point within the circular region having a maximum mean joint probability as the seed point;

growing a region of interest around the seed point;

calculating directional gradients for each pixel in the image;

determining boundary points of the region of interest using the directional gradients; and

processing the boundary points with a deformable model to determine the presence or absence of a tumor or lesion in the image.

2. (Original) The method of claim 1, wherein the step of acquiring the image comprises digitizing the image from an analog mammogram.

3. (Original) The method of claim 1, wherein the step of acquiring the image comprises acquiring a digital mammogram, ultrasound, or MRI image of a breast.

4. (Original) The method of claim 1, wherein the step of filtering the image comprises removing speckle from the image using a Butterworth filter.

5. (Original) The method of claim 4, further comprising enhancing contrast of the image.

6. (Original) The method of claim 1, wherein the step of applying texture and intensity classifiers comprises determining intensity and local variance of each pixel of the image.

7. (Original) The method of claim 6, further comprising applying a texture probability distribution function to the local variance of the pixel to produce the texture classifier.

8. (Original) The method of claim 6, further comprising applying an intensity probability distribution function to the intensity of the pixel to produce the intensity classifier.

9. (Cancelled)

10. (Original) The method of claim 1, wherein the step of growing the region of interest comprises:

adding the seed point to the region of interest; and

adding pixels to the region of interest based upon connectivity and values of surrounding pixels.

11. (Original) The method of claim 1, wherein the step of determining boundary points comprises scanning the region of interest horizontally and vertically to determine edge points, and combining the edge points.

12. (Original) The method of claim 11, further comprising drawing radial lines from the seed point and plotting boundary points corresponding to positions of maximum intensity on the radial lines.

13. (Original) The method of claim 12, further comprising removing outliers and local maxima from the boundary points.

14. (Currently Amended) An apparatus for automatically detecting breast tumors and lesions in an image comprising:

a scanner for generating an image of a breast;

a filter for filtering the image;

texture and intensity classifiers applied to each pixel of the image, the classifiers corresponding to probabilities of the pixel belonging to a lesion or tumor;

means for determining a seed point in the image, wherein said means retrieves a set of points of interest in the image, selects a first point from the set of points, and calculates a joint probability that the first point corresponds to a tumor;

means for growing a region of interest around the seed point;

means for calculating directional gradients for each pixel in the image;

means for determining boundary points of the region of interest using the directional gradients; and

a deformable model for processing the boundary points to determine the presence or absence of a tumor or lesion in the ~~image.~~ image.

wherein the means for determining the seed point calculates mean joint probabilities that points in a circular region around the first point correspond to a tumor.

15. (Original) The apparatus of claim 14, wherein the scanner comprises an analog mammogram scanner, a digital mammogram scanner, an ultrasound scanner, or an MRI scanner.

16. (Original) The apparatus of claim 14, wherein the filter comprises a Butterworth filter for removing speckle from the image.

17. (Previously Presented) The apparatus of claim 14, wherein the texture and intensity classifiers are generated by texture and intensity probability distribution functions applied to pixels of the image.

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Currently Amended) The apparatus of claim ~~21,~~ 14, wherein the means for determining the seed point designates a point within the circular region having a maximum mean joint probability as the seed point.

23. (Original) The apparatus of claim 14, wherein the means for growing the region of interest adds the seed point to the region of interest and adds pixels to the region of interest based upon connectivity and values of surrounding pixels.

24. (Original) The apparatus of claim 14, wherein the means for determining boundary points scans the region of interest horizontally and vertically to determine edge points, and combines the edge points.

25. (Original) The apparatus of claim 24, wherein the means for determining boundary points draws radial lines from the seed point and plots boundary points corresponding to positions of maximum intensity on the radial lines.

26. (Original) The apparatus of claim 25, wherein the means for determining the boundary points removes outliers and local maxima from the boundary points.

27. (Currently Amended) A method for automatically detecting breast tumors and lesions in an image comprising:

acquiring an image of a breast;

filtering the image;

applying texture and intensity classifiers to each pixel of the image, the classifiers

corresponding to probabilities of the pixel belonging to a lesion or tumor;

determining a seed point in the image;

growing a region of interest around the seed point;

calculating directional gradients for each pixel in the image;

determining boundary points of the region of interest using the directional gradients by scanning the region of interest horizontally and vertically to determine edge points, and combining the edge points;

drawing radial lines from the seed point and plotting boundary points corresponding to positions of maximum intensity on the radial lines; and

processing the boundary points with a deformable model to determine the presence or absence of a tumor or lesion in the ~~image.~~ image,

wherein the step of determining the seed point comprises:

retrieving a set of points of interest in the image;

selecting a first point from the set of points;

calculating a joint probability that the first point corresponds to a tumor;

calculating mean joint probabilities that points in a circular region around the first point correspond to a tumor; and

designating a point within the circular region having a maximum mean joint probability as the seed point.

28. (Previously Presented) The method of claim 27, wherein the step of acquiring the image comprises digitizing the image from an analog mammogram.

29. (Previously Presented) The method of claim 27, wherein the step of acquiring the image comprises acquiring a digital mammogram, ultrasound, or MRI image of a breast.

30. (Previously Presented) The method of claim 27, wherein the step of filtering the image comprises removing speckle from the image using a Butterworth filter.

31. (Previously Presented) The method of claim 30, further comprising enhancing contrast of the image.

32. (Previously Presented) The method of claim 27, wherein the step of applying texture and intensity classifiers comprises determining intensity and local variance of each pixel of the image.

33. (Previously Presented) The method of claim 32, further comprising applying a texture probability distribution function to the local variance of the pixel to produce the texture classifier.

34. (Previously Presented) The method of claim 32, further comprising applying an intensity probability distribution function to the intensity of the pixel to produce the intensity classifier.

35. (Cancelled)

36. (Previously Presented) The method of claim 27, wherein the step of growing the region of interest comprises:

adding the seed point to the region of interest; and

adding pixels to the region of interest based upon connectivity and values of surrounding pixels.

37. (Previously Presented) The method of claim 27, further comprising removing outliers and local maxima from the boundary points.

38. (Currently Amended) An apparatus for automatically detecting breast tumors and lesions in an image comprising:

a scanner for generating an image of a breast;

a filter for filtering the image;

texture and intensity classifiers applied to each pixel of the image, the classifiers corresponding to probabilities of the pixel belonging to a lesion or tumor;

means for determining a seed point in the image;

means for growing a region of interest around the seed point;

means for calculating directional gradients for each pixel in the image;

means for determining boundary points of the region of interest using the directional gradients, the means drawing radial lines from the seed point and plots boundary points corresponding to positions of maximum intensity on the radial lines; and

a deformable model for processing the boundary points to determine the presence or absence of a tumor or lesion in the ~~image.~~ image.

wherein the means for determining the seed point retrieves a set of points of interest in the image, selects a first point from the set of points, calculates a joint probability that the first point corresponds to a tumor, and calculates mean joint probabilities that points in a circular region around the first point correspond to a tumor.

39. (Previously Presented) The apparatus of claim 38, wherein the scanner comprises an analog mammogram scanner, a digital mammogram scanner, an ultrasound scanner, or an MRI scanner.

40. (Previously Presented) The apparatus of claim 38, wherein the filter comprises a Butterworth filter for removing speckle from the image.

41. (Previously Presented) The apparatus of claim 38, wherein the texture and intensity classifiers are generated by texture and intensity probability distribution functions applied to pixels of the image.

42. (Cancelled)

43. (Cancelled)

44. (Cancelled)

45. (Cancelled)

46. (Currently Amended) The apparatus of claim ~~45,~~ 38, wherein the means for determining the seed point designates a point within the circular region having a maximum mean joint probability as the seed point.

47. (Previously Presented) The apparatus of claim 38, wherein the means for growing the region of interest adds the seed point to the region of interest and adds pixels to the region of interest based upon connectivity and values of surrounding pixels.

48. (Previously Presented) The apparatus of claim 38, wherein the means for determining boundary points scans the region of interest horizontally and vertically to determine edge points, and combines the edge points.

49. (Previously Presented) The apparatus of claim 38, wherein the means for determining the boundary points removes outliers and local maxima from the boundary points.